

Pike Loop

A site-specific installation by Gramazio & Kohler
Architecture and Digital Fabrication, ETH Zurich

Pike St. between East Broadway and Division St., New York
Construction: October 5 – 27, 2009, 9am – 7pm [Visitors welcome]
Inauguration: October 27, 2009, 7pm

Digital Materiality

Research projects by Gramazio & Kohler
Architecture and Digital Fabrication, ETH Zurich

An exhibition at Storefront for Art and Architecture
97 Kenmare St., New York

October 1 – November 14, 2009

Opening reception: September 30, 2009, 7pm

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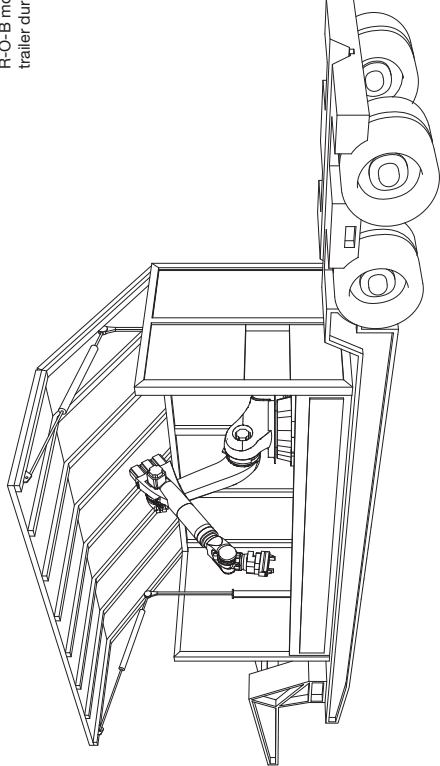
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R-O-B mounted on a towed trailer during operation



R-O-B Robotic Fabrication Unit In cooperation with Keller AG Ziegeleien

R-O-B transforms the traditional process of prefabricated construction: the robot leaves the protected environment of the factory and ventures out to the building site. Housed in a modified freight container, the R-O-B mobile fabrication unit can be used anywhere in the world. It combines the advantages of prefabrication – precision and consistently high quality – with the advantages of shortened transport routes and just-in-time production on the building site. Furthermore, the mobile fabrication unit is not restricted to a predefined manufacturing process or a particular building material, but is intended for flexible on-site use. It can also produce highly varied, digitally derived structures using local materials. The R-O-B unit will be employed where it is able to play off its advantages over traditional building methods: in the manufacture of building elements with highly specific forms which can therefore only be designed and fabricated through digital processes and the use of computer-controlled machines.

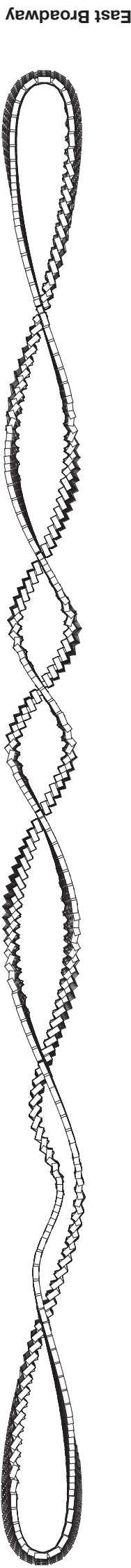
Pike Loop

Pike Loop is a 22m (72ft) long structure is built from seven thousand bricks aggregate to form an infinite loop that weaves along the pedestrian island: in changing rhythms the loop lifts off the ground and intersects with itself in peaks and valleys, and the massive weight of the bricks is brought to a delicate suspension. The digitally designed brick structure is further articulated in the attention of compression and tension in the bond of the bricks. The structure is designed to be as light as possible and thus lighter, where it brings loads to the ground it becomes heavier, and thus wider and more stable.

The continuous form and homogeneous expression of the structure is achieved by means of the mobile robotic fabrication unit R-O-B housed in a transportable freight container. R-O-B was shipped from Switzerland to New York and loaded onto a low-bed trailer for transport and on-site fabrication. The moving of R-O-B along the site in order to build the complete structure.

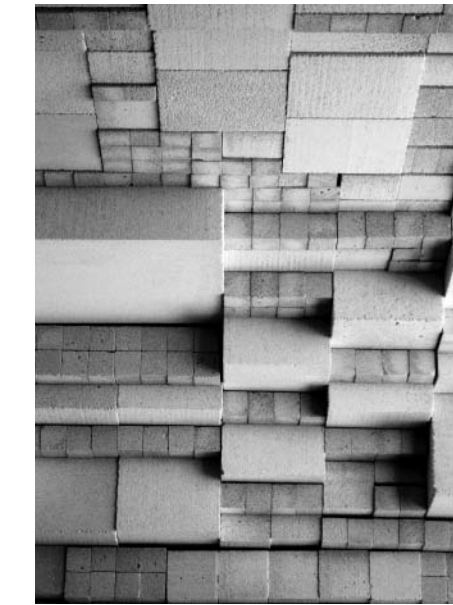
The first public installation built with R-O-B, Structural Oscillations, was exhibited at the 2008 International Architecture Biennale in Venice. While the installation in Venice was prefabricated next to the site, Pike Loop is the first installation that is directly built in situ.

Division St.



Pike St.

Plan



Elevation

R-O-B

About Gramazio & Kohler, Architecture and Digital Fabrication, ETH Zurich

The research unit of Gramazio & Kohler for Architecture and Digital Fabrication, located at the Faculty of Architecture at ETH Zurich, was established in October 2005. The unit explores the concept of "digital materiality", the implications of digital fabrication on the architectural design process. The possibility of producing building components described on the computer through the use of digital fabrication techniques not only expands the spectrum of possible construction products, but, by directly informing the design process with the logics of construction techniques as well as to rethink traditional ones, the material and construction system, validates a unique architectural expression and a new aesthetic.

In order to examine these new production conditions, Gramazio & Kohler developed a flexible construction facility in order to build and test building components at a small scale. Being a generic machine, the robot can work with different tools depending on the specificity of the performed task. This indeterminacy allows to implement novel construction techniques as well as to rethink traditional ones.

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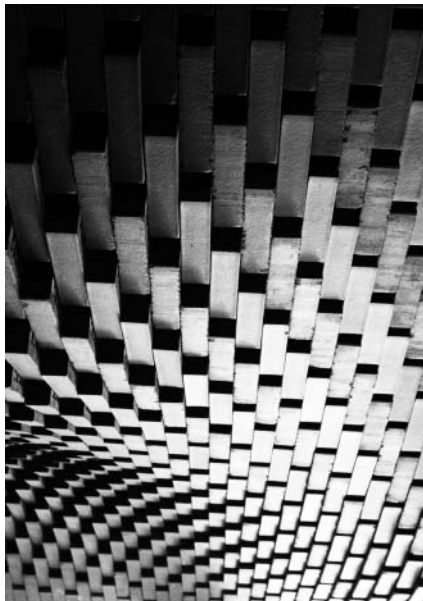
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are an initiative of the Research Unit for Art and Architecture
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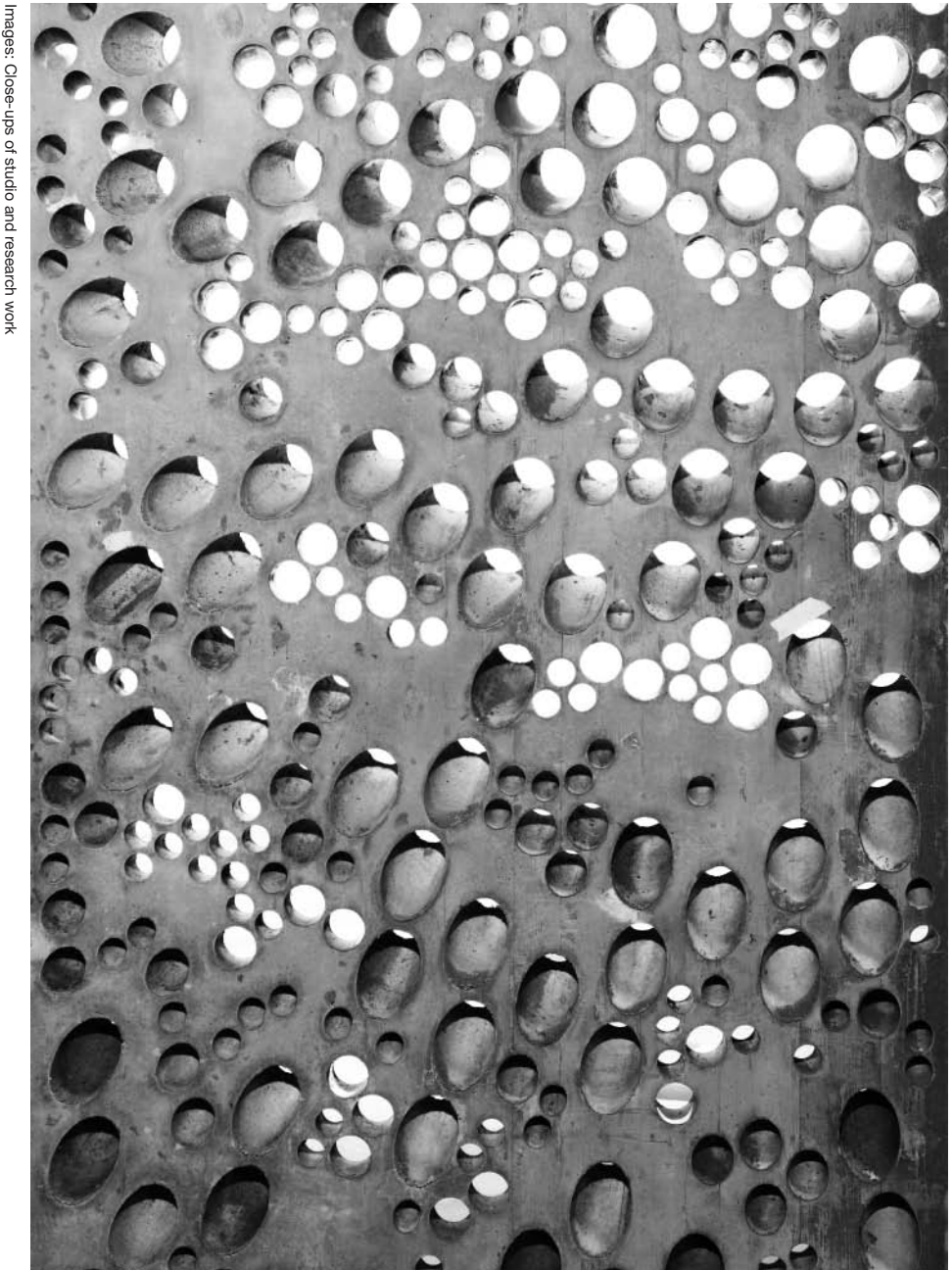


Digital Materiality: Bridging the Realms of the Virtual and the Physical
With the term "digital materiality", Gramazio & Kohler designates an emergent transformation in the expression of architecture. They recognize that materiality is increasingly being enriched with digital characteristics, and these characteristics significantly affect the material nature of built architecture. Digital materiality arises from the interaction between digital and material processes during design and construction. The synthesis of these two seemingly disparate realms is the result of the digital fabrication process, which allows the architect of today to weave design data directly into the material building process. In this way, material is enriched with information—it is informed. In the future, architects will be able to intervene deeply in digital fabrication processes, and thus transform the possibilities and thus the professional scope of the architect.

Digital Materiality arises through the coupling of construction and programming by taking advantage of the conceptual similarities between the fabrication of a building component and the programming of a computer. Computer programs describe the processing of data as a sequence of individual steps in calculation. Likewise, the fabrication of a building component is carried out in a temporal sequence of individual steps. By mapping the second level of constructibility to design, the fabrication process directly, as a result, design and execution are no longer distinct, temporally adjacent phases. The design incorporates the knowledge of its production already at the moment of its conception. In turn, this has the consequence that with digital technology the understanding of construction as an integral part of architectural design takes on greater significance. With this emerging digital craftsmanship, architecture is being enriched.

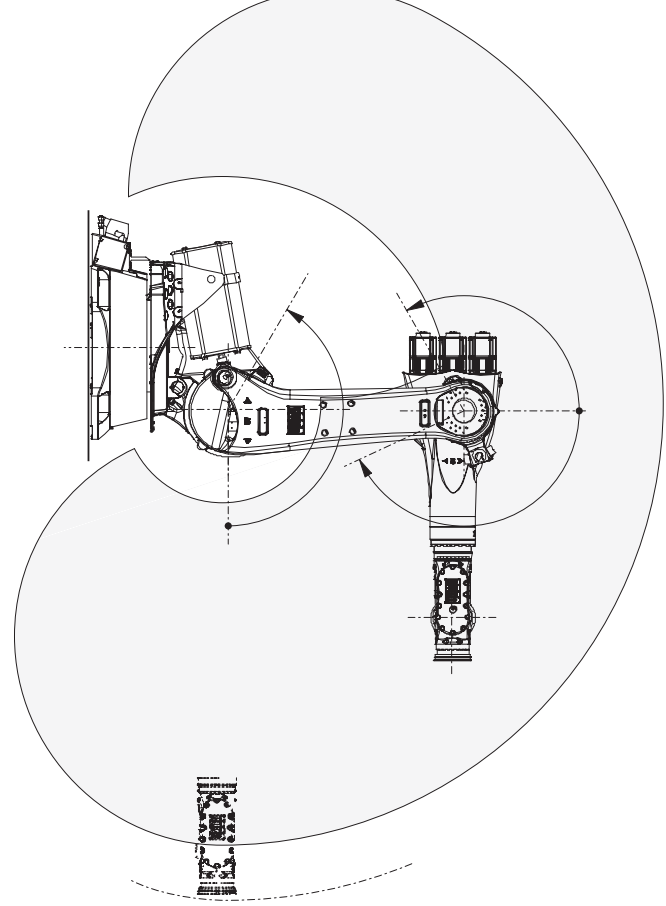
Digital Materiality leads to a new expression and, surprisingly enough, given the technical associations of the term "digital", to a new sensuality in architecture. It consists in the formation of digital and material orders distinguished by an unusually high number of precisely organized elements, delicate detailing and the parallel presence of different scales of formation. Despite its intrinsic complexity, one experiences and understands it intuitively. Digital materiality, however, is not solely anchored in the material world and its principles; to an equal extent, it incorporates the principles of the immaterial world of digital logic, such as its self-organizing capacity and its recursive nature. Through digital fabrication, the architectural design and the materials are expressed in an intensified form. Materials do not appear primarily as texture or surface, but in their whole depth and plasticity. Familiar materials, such as brick—which is more than 9000 years old—are rediscovered in new manifestations. For the viewer, a tension arises between the intuitively comprehensible properties of a material and a formal logic that is not always evident at first sight. The logic can be felt, but not named. It is this tension that seduces the senses and invites them to linger.

Digital Materiality leads beyond the shaping of static forms and images to the design of material processes. There, geometry in drawn or modeled form is relinquished as the central design medium or the basis for its judgment. Instead, the architect designs relationships and sequences that thrive in architecture and become its physical form. As soon as one begins to conceive such material processes, an entirely new way of thinking of architecture is open to exploration. It is a new conceptual way of designing with architectural parameters, conditions, relationships, and degrees of freedom, a weighing of influences between the form-generating factors, a play of material and spatial control these in an iterative process. When architecture is designed as material process, one does not design a static plan but instead a dynamic set of rules: the architect now designs a behavior.



Images: Close-ups of studio and research work

Digital Materiality: Research in Digital Fabrication
Gramazio & Kohler, Architecture and Digital Fabrication, ETH Zurich



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